CLAIMS

What is claimed is:

1. A lightweight, four stroke engine, comprising:

a crankcase enclosure;

at least one piston assembly disposed within the crankcase enclosure, the piston assembly cooperating with the crankcase enclosure to provide an internal pressure to the crankcase enclosure which varies between a positive and a negative pressure;

an air intake assembly operatively coupled to a first section of the engine and the crankcase enclosure, the air intake assembly including at least one air conduit configured to provide non-combustive air flow from the first section of the engine to the crankcase enclosure of the engine; and

at least one valve disposed within the air intake system, the valve being configured to restrict air flow from the crankcase enclosure when positively pressurized and to allow airflow into the crankcase enclosure when negatively pressurized.

2. The engine of claim 1, wherein the first section of the engine is a cam cover enclosure of the engine, and wherein the air intake assembly circulates air from the cam cover enclosure to the crankcase enclosure.

3. The engine of claim 1, further comprising a dry sump lubricant distribution system operatively coupled to the air intake system, the dry sump lubricant distribution system and the air intake system cooperating to scavenge lubricant from the engine, the dry sump lubricant distribution system configured to enable operation of the engine in a vertical, horizontal or intermediate configuration.

4. The engine of claim 1, further comprising a second air conduit operatively coupled to the crankcase enclosure and the combustion chamber of the engine, the second air conduit providing pressurized air from the positively pressurized crankcase enclosure to the combustion chamber to increase an overall pressure of a combustible mixture provided to the combustion chamber of the engine.

5. A lightweight, four stroke engine, comprising:

an engine housing comprised only of three major housing components, the housing components including;

a lower crankcase housing, an upper crankcase housing, and a cylinder terminal housing; and

a piston assembly operatively disposed within the engine housing;

the engine housing being configured to provide an operating enclosure for the piston assembly while minimizing an overall weight of the engine.

6. The engine of claim 5, wherein the cylinder terminal housing includes both an integral cylinder head portion and an integral cylinder wall portion, the cylinder wall portion being configured to restrain the cylinder in linear, reciprocating motion and the cylinder head portion being configured to facilitate provision of combustion material to the cylinder wall portion and extraction of exhaust material from the cylinder wall portion.

7. The engine of claim 5, further comprising a plurality of head studs, each stud being disposed through at least two of the housing components, the head studs being configured to secure the cylinder terminal housing to the upper crankcase housing.

8. The engine of claim 7, wherein the head studs are each disposed through each of the lower crankcase housing, the upper crankcase housing, and the cylinder terminal housing.

9. The engine of claim 7, wherein the plurality of head studs includes at least one stud that includes at least a partially hollow section therein, the at least one stud being configured to secure the housing components to each other and to convey lubricant through the stud.

10. The engine of claim 5, wherein the housing components are each sealed to an adjacent housing component with a substantially continuous sealing structure.

11. The engine of claim 10, wherein the substantially continuous sealing structure includes an O-ring seal.

12. The engine of claim 5, wherein the cylinder terminal housing is operatively attachable to the upper crankcase housing in at least two orientations, to facilitate interchange of intake and exhaust sides of the engine to allow customization of the engine for varying applications.

13. The engine of claim 5, further comprising a reversible starter motor operatively coupled to the piston assembly and at least one reversible camshaft operatively coupled to a valve assembly of the engine, the reversible starter motor and camshaft being configured to each be rotated to facilitate operation of the engine in an opposite direction.

14. The engine of claim 5, further comprising a crankshaft disposed within the crankcase enclosure, and a ring gear disposed intermediate ends of the crankshaft, the ring gear providing a rotating counterweight force to the crankshaft.

15. The engine of claim 5, further comprising a pair of power outputs operatively disposed on opposing ends of the engine to facilitate extraction of power from the engine from either or both ends of the engine.

16. The engine of claim 5, further comprising air intake air system associated with the engines, and an integral engine management system disposed within the air intake system, the air intake system providing cooling for the engine management system and the engine.

17. The engine of claim 5, further comprising at least one camshaft associated with the cylinder terminal housing, the camshaft including at least one hollow section formed therein to reduce an overall weight of the engine.

18. The engine of claim 17, wherein the at least one hollow section is disposed in a portion of the camshaft characterized by a presence of minimal stresses in the camshaft.

19. The engine of claim 5, wherein the cylinder terminal housing includes a combustion chamber, the combustion chamber being at least partially treated with a ceramic material to reduce an overall weight of the engine.

20. A lightweight, four stroke engine, comprising:

an engine body having an air intake system terminating on an intake side of the engine and an exhaust system terminating on an exhaust side of the engine; and

an external air cooling circulation system configured to circulate air around the engine body from the intake side of the engine to the exhaust side of the engine to provide air cooling to the engine.

21. The engine of claim 20, further comprising:

a cooling fan and shroud associated with the external air cooling system, the cooling fan being operatively coupled to a crankshaft of the engine to convert rotating motion of the crankshaft into airflow for cooling of the engine.

22. The engine of claim 21, wherein the cooling fan comprises a turbofan and is disposed adjacent the exhaust side of the engine to draw air from the intake side of the engine to the exhaust side of the engine.

23. A lightweight, four stroke engine, comprising:

an engine body; and

a disk rotor, operatively coupled to a crankshaft of the engine, the disk rotor having at least one vane associated therewith; and

at least one stator, disposed adjacent the disk rotor;

the stator and disk rotor being configured to cooperatively produce electrical power in response to rotation of the crankshaft while the disk rotor vane produces airflow for cooling the engine.

24. The engine of claim 23, wherein the stator is disposed around at least a portion of a periphery of the disk rotor.

25. The engine of claim 23, further comprising:

at least one magnet disposed in the outer periphery of the disk rotor; and

the stator including a core and coil assembly disposed around at least a portion of the outer periphery of the stator.

26. The engine of claim 23, further comprising:

at least one magnet disposed within the disk rotor with two opposing sides of the magnet exposed to the stator on opposing sides of the disk rotor, and

a stator formed as a stationary caliper over a perimeter of the disk rotor, the stator including windings oriented about a circumference of the disk rotor on an inside of the stationary caliper, the windings disposed parallel to rotation of the disk rotor.